

A **linear equation** in variables x_1, x_2, \dots, x_n is an equation of the form $a_1x_1 + a_2x_2 + \dots + a_nx_n = b$, where b and the coefficients a_1, a_2, \dots, a_n are real or complex numbers, usually known in advance. The subscript n can be any positive integer.

A **system of linear equations (linear system)** is a collection of one or more linear equations involving the same variables.

A **solution** of the system is a list of numbers s_1, s_2, \dots, s_n that makes each equation a true statement when substituted for x_1, x_2, \dots, x_n , respectively. The set of all possible solutions is the **solution set** of the system. Two linear systems are **equivalent** if they have the same solution set.

A system of linear equations is said to be **inconsistent** if it has no solution. It is **consistent** if it has either one solution or infinitely many solutions.

Consider the linear system

$$\begin{aligned}x_1 - 2x_2 + x_3 &= 0 \\2x_2 - 8x_3 &= 8 \\-4x_1 + 5x_2 + 9x_3 &= -9\end{aligned}$$

The matrix

$$\begin{bmatrix} 1 & -2 & 1 \\ 0 & 2 & -8 \\ -4 & 5 & 9 \end{bmatrix}$$

is called the **coefficient matrix** of the system. The matrix

$$\begin{bmatrix} 1 & -2 & 1 & 0 \\ 0 & 2 & -8 & 8 \\ -4 & 5 & 9 & -9 \end{bmatrix}$$

is called the **augmented matrix** of the system. The **size** of a matrix indicates the number of rows and columns a matrix has. An $m \times n$ matrix is a rectangular array of numbers with m rows and n columns.